

THE ORIGIN OF COAL.

Die Entstehung der Steinkohle und der Kaustobiolithe überhaupt. By Prof. H. Potonié. Fünfte Auflage. Pp. xi+225. (Berlin: Gebrüder Borntraeger, 1910.) Price 7.80 marks.

THE study of the probable mode of formation of coal and kindred substances has for many years engaged the attention of Prof. Potonié, who, as palæobotanist in the University of Berlin, and also as a member of the Geological Survey of Prussia, has had exceptional opportunity for such study, both in the cabinet and in the field. At the York meeting of the British Association in 1906, he laid before the Botanical Section his views on the origin of coal, and the following year issued the fourth edition of his little work, "*Die Entstehung der Steinkohle, u.s.w.*"—an octavo of only forty-seven pages, which was briefly noticed in *NATURE* (vol. lxxviii., p. 86). In the new edition, recently published, the work has been considerably enlarged, and the title so modified as to indicate that it deals with the origin of caustobioliths generally.

Under this term *caustobioliths* are included all those rocks or mineral substances which are, directly or indirectly, of organic origin, and are combustible, whilst such organic rocks as are incombustible, like chalk, are distinguished as *acaustobioliths*. In order to explain the origin of the fossil deposits, the author has wisely given much attention to the corresponding recent formations, or what may be reasonably regarded as such. Three great groups of caustobioliths are recognised. In the first place, there are the rocks called *sapropelites*, formed from organic slime, or sapropel, resulting from the partial decay of aquatic organisms and their products in stagnant water. When the sapropel, in a sub-fossil state, becomes gelatinous, it is distinguished as *saprocoll*, whilst the Tertiary forms are described as *saprodil*, and the older varieties as *sapanthracon*. It is a disadvantage that the work is rather heavily weighted with an unfamiliar terminology, but it must be conceded that most of the terms are expressive, and in many cases undoubtedly convenient.

Cannel coal, boghead mineral and many so-called bituminous shales are regarded as sapropelites, whilst petroleum is considered by Prof. Potonié to be a product of the natural distillation of deep-seated sapropel rocks, which have been exposed to heat and pressure during processes of mountain-building.

Another great group of caustobioliths is formed by the humus rocks, which result from the accumulation of the remains of land-plants and bog-plants. This important class contains not only many brown coals, but our ordinary coals and anthracites. Whilst sapropel rocks, generally present a dull surface, or a silky lustre, and when heated yield much gas, the humus rocks, or at any rate those of Palæozoic age, are usually lustrous and yield a smaller proportion of gas. Coal which shows an alternation of bright and dull layers is regarded as a mixed caustobiolith, derived partly from humus, partly from sapropel.

To Prof. Potonié common coal is a rock which in most cases has been formed where it is now found, mainly by the fossilisation of deposits of peat, often in far-stretching swamps. Considering the modern tendency, especially in France, to regard most coal as a substance of allochthonous formation, it is interesting to find a distinguished specialist upholding the view of "growth in place," which until recently has been so much favoured in this country.

Peaty deposits, though not formed of transported material, may exhibit stratification, and humus matter may be partially dissolved in water and precipitated in layers. The coal-forming peat was probably in a pulpy condition. In certain cases, the author suggests that the appearance of stratification is explicable as the result of pressure acting in a direction at right angles to that of the lamination. Prof. Potonié holds that the flora of the coal measures indicates a tropical climate, and cites instances of the extensive growth of peat in tropical swamps, as in the fens of Sumatra, described by Dr. S. H. Koorders.

Distinct from both the sapropelites and the humus rocks is a small group of caustobioliths called *liptobioliths*, of which amber and pyropissite are examples. The liptobioliths consist chiefly of resinous and waxy substances, which by their resistance to decomposition are left after the decay of the other parts of the original organism.

Throughout the work the author gives numerous references to original authorities, but unfortunately in most cases without sufficient detail, the reference being usually limited to the name of the author and date of publication, such as "vergl. Uthemann, 1892." The student seeking further information would be grateful for a little more definite guidance.

F. W. R.

THE VOICE AND SINGING.

- (1) *The Brain and the Voice in Speech and Song.* By Prof. F. W. Mott, F.R.S. Pp. xi+112. (London and New York: Harper and Brothers, 1910.) Price 2s. 6d. net.
- (2) *The Abuse of the Singing and Speaking Voice: Causes, Effects, and Treatment.* By Prof. E. J. Moure and A. Bowyer, Fils. Translated by Macleod Yearsley. Pp. xi+130. (London: Kegan Paul, Trench, Trübner and Co., Ltd., 1910.) Price 2s. 6d. net.
- (3) *The Voice. An Introduction to Practical Phonology.* By Dr. W. A. Aikin. Pp. ix+159. (London: Longmans, Green and Co., 1910.) Price 7s. 6d. net.

THERE are now many manuals dealing with the voice and with the management of the voice and singing. These are unequal in value, more especially as regards the description of the anatomy and physiology of the organs of voice and speech, and not unfrequently the writer strongly advocates a view peculiarly his own, and on which he founds his method of training. It is therefore of importance to have a description of the organs concerned in voice

and speech from the hand of an experienced physiologist, who is at the same time sympathetic with music and with the arts of speaking and singing. This we have in Dr. Mott's admirable little book (1). Nothing could be better than the description he gives of the whole mechanism, and in language that any intelligent person can understand. In particular, and as one would expect from a distinguished neurologist, Dr. Mott shows the intimate relations of the organs of voice and speech to the brain centres of hearing and of motion, both as regards the delicate movements of the mechanism of voice and of articulation, and as regards posture and other bodily movements. Teachers of the art of voice production, as in singing or in the articulation of words and sentences in public speaking, know little of this side of their subject, and we feel sure that much of Dr. Mott's information will be to them a revelation. A study of his book will in some respects modify their mode of teaching.

(2) Messrs. Moure and Bowyer's book is of a different character. It deals with voice production in singing, but more especially with the serious mistakes that may be made by methods of teaching, or by the strain put on voices by singers themselves, that cannot fail to injure the vocal apparatus. We would recommend that a student should, in the first instance, carefully study Dr. Mott's book, and then take up that of the French authors. In the latter there is first an interesting historical sketch of the teaching of singing, from the time of the Romans onwards. The church was the first educator of singers, to meet the requirements of the plain chant. Trills, tremolos, and shakes by and by embroidered the tones, and it is curious that for many years falsetto voices were in great request. The invention of the madrigal in the sixteenth century enriched vocal music and made greater demands on performers. Thus much was done before a physiological basis was laid by Garcia, after the revelations made to him by his invention of the laryngoscope.

The description of the mechanism is not so thorough in the French book as that given by Dr. Mott, and it may give some superficial if not erroneous notions. The portion on the registers is well done, and more especially the description of the mixed or middle register. The chapter on "Vocal abuse" gives much valuable information. Both teachers and singers often forget that there should be a physiological harmony between different parts of the vocal apparatus. Pulmonary capacity, muscular power, the dimensions and delicacy of structure of the vocal cords, are all more or less related. Strong and sudden expiratory efforts made with the view of increasing the volume of the voice may injure delicate cords. A light tenor may make the mistake of trying to do what only a strong tenor can accomplish, or the tenor may even imagine he is a baritone. It is true that no laryngoscopic examination can enable a master to determine what his pupil is capable of doing, but a few trials, cautiously carried out with such solos for various voices as are given in detail on p. 104, would soon settle the question. Singers may also injure their voices by frequent displacement or change in the

range of their voice. The same baritone in some circumstances may have to sing on successive days, or even on the same day, as a deep baritone or a high baritone of the Verdi type. Modern composers, and especially Wagner and his followers, have injured many voices by the demands they have made, as, for example, in *Tristan and Yseult*. They have been called "the executioners of the voice." Some singers never learn properly how to breathe, and by taking in too large a volume of air and expelling it with violence, by "bellowing," in fact, they may even produce emphysema of the lung. The chest voice is difficult to manage, and it may be much injured, by welding two registers, and thus destroying purity of tones. The scales showing the range of the registers on pp. 80-81 are very instructive.

There is an admirable chapter on some of the pathological effects of abuse. We find also an appendix showing the vocal ranges of varieties of voices, such as strong tenors, opera tenors, opera-comique tenors, baritones, high baritones, or Verdi baritones, basses, basso cantando, basso profondo, contralto, high soprano, mezzo-soprano, and dramatic soprano, and, to add to the interest of the list, the names of many of the distinguished artists of their day are given. The authors also point out, and illustrate by portraits, the relation that often exists between the physical appearance of the singer and the range and quality of the voice. There are some signs of haste in the translation; p. 15, line 4, should not "cause" be case? Second sentence on p. 21 not clear. It is difficult to understand the portion of the sentence at the top of p. 42. At middle of p. 42 insert "if" before he. As we have already indicated, the French Book is the complement to that of Dr. Mott, and both taken together leave little else to be written on the subject.

(3) This book is an admirable account of the mechanism of both speech and song. There is a full description of the physiological mechanism concerned in the formation of vowel tones and the sounds of consonants. The action of the vibrators (the vocal cords) and the management of the resonator (the cavities of the pharynx, mouth, nose, &c.), is illustrated by exercises which a reader can readily follow, and the rules to be attended to in the management of the breath are given with physiological explanations. Two notable features of the book are a pronunciation chart showing methods for the practice of English pronunciation, and figures termed by the author "Song diagrams," showing the capacity of the various kinds of voices, from deep bass to high soprano. Composers would do well to study the figures on pp. 138, 139, and 140, where they would see at once the exorbitant demands on the voices of great operatic singers made by certain composers, notably by Wagner and even by Beethoven. The effect of the prolongation of very high tones may be brilliant and striking, but their production must cause, in many cases, serious tear and wear to a fine voice. As a truly scientific exposition, dealing with a subject that has an important practical aspect, Dr. Aiken's book is to be strongly recommended.

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